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### Numerical study of the transition to chaos in nonlinear forced vibrations of plates.

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## ABSTRACT

Geometrically nonlinear vibrations of free edge circular plates subjected to a harmonic excitation are discussed. Particularly, transition from periodic to chaotic motion is observed when increasing the amplitude of the forcing. The present work is devoted to reproduce numerically these highly nonlinear behaviours. The temporal integration of such dynamics, including instabilities and chaotic regimes, is not straight forward because a stiff problem with a very large number of dofs is at hand. Consequently, numerical instabilities are observed when typical Runge-Kutta schemes are applied. To settle the matter, two methods have been tested and compared. They both rely on a modal approach applied to the von Karman's model for large amplitude vibrations of plate. For the first one, the energies of the plates are expressed at the continuous level. The Hamiltonian of the system is then derived and discretized using the eigenmodes. The Hamiltonian formulation ensures the conservation of energy. An implicit time discrete scheme is then chosen to approximate the equations of motion. For the second one, the Gear's BDF method, implemented in the IMSL Fortran library, is used to integrate the nonlinear oscillator equations.